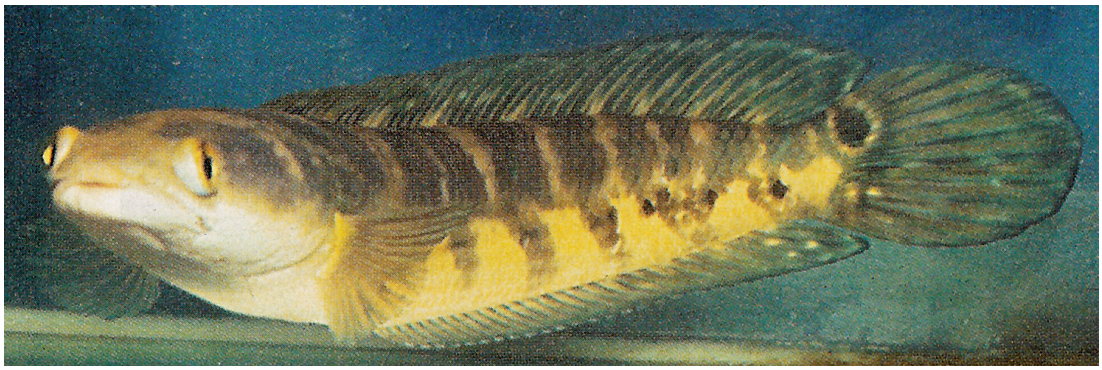
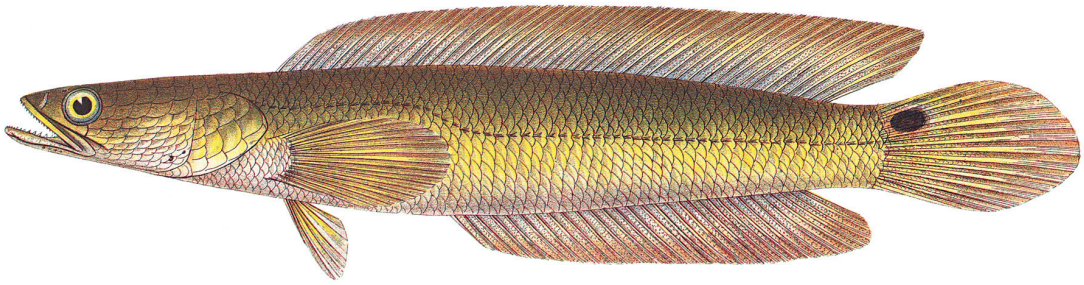
Channa marulioides (Bleeker, 1851)
Emperor Snakehead



Reprinted with permission from P.K.L. Ng from: Lee, P.G., and P.K.L. Ng. 1991. The snakehead fishes of the Indo-Malayan region. Nature Malaysiana 16(4):112-129. Adult; photo by J. Vierke.



After Bleeker, 1878

Original description: *Ophicephalus marulioides* Bleeker, 1851:424. Vijfde bijdrage tot de kennis der ichthyologische fauna van Borneo, met bescrijving van eeinige nieuwe soorten van zoetwatervisschen. Natuurkd. Tijdschr. Neder. Indië 2:415-442. Type locality: Sambas, Kalimantan (southern Borneo), Indonesia. Whereabouts of holotype unknown.

Synonyms: No known synonyms (Roberts, 1989; Ng and Lim, 1990).

Common names: **emperor snakehead**; darkfin snakehead; ikan jaloi (Malay); toman bunga (=flower snakehead; Malaysia).

Native range: Rivers (Musi, Hari, Indragiri, and others) of southeastern Sumatra; Kapuas basin of western Kalimantan (southern Borneo; Roberts, 1989, Kottelat, 1994); Bangka (Banka) and Belitung (Billiton) (Roberts, 1989). Peter Ng (personal commun., 2003) collected this species in Samarinda, eastern Kalimantan, in November 1999. In peninsular Malaysia, occurring mostly toward the center of the peninsula in Pahang (Lee and Ng, 1994). Often confused with *Channa melanoptera* (Lee and Ng, 1994). Also recorded from southern Thailand (Malay Peninsula) by Herre and Myers (1937) and reported as the only record from that country (Smith, 1945). Kottelat and others (1993) did not list Thailand within its native range, although it is possible that its range extends northward into extreme southern Thailand. Ismail (1989) included Thailand within native range but added that the species was “quite rare” in peninsular Malaysia.

Introduced range: No introductions known.

Channa marulioides, caught and released from jungle of Perak State, Malaysia, January 2003. Photo courtesy of Jean-Francois Helias, Fishing Adventures Thailand.

Size: To 65 cm (Lee and Ng, 1994).

Habitat preference: A riverine species (Kottelat, 1994), also found in lakes, appearing to be an inland species (Lee and Ng, 1994).

Temperature range: No specific information found. The native range is equatorial/tropical.

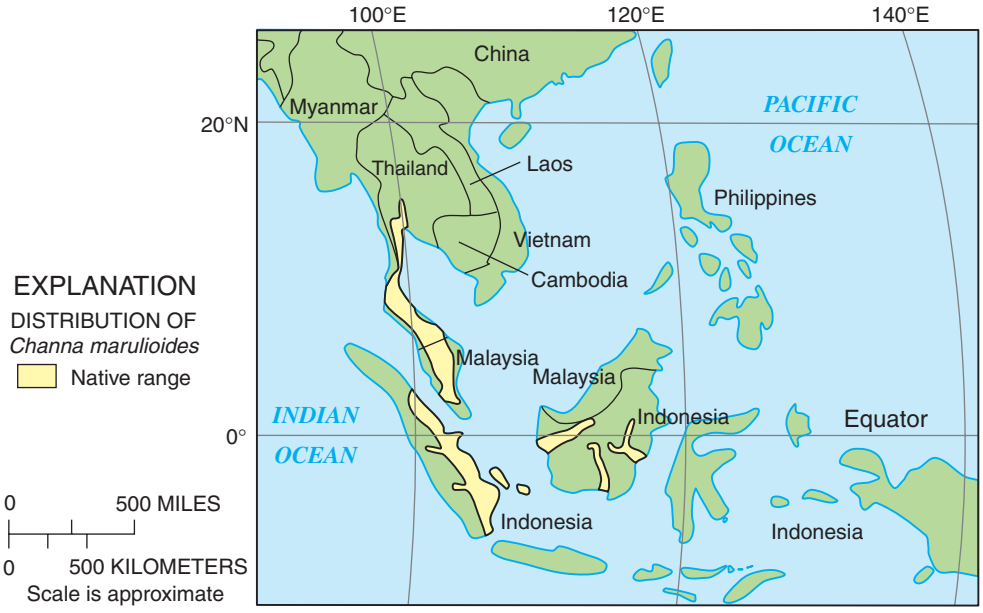
Reproductive habits: No specific information found. Likely a nest builder with adults guarding fertilized eggs and larvae.

Characters: No patch of scales on gular region of head. Dorsal fin rays 45-47; anal fin rays 30-31. Lateral line scales 55-58; predorsal scales 13-15. Scales between lateral line and anterior rays of dorsal fin 3½. Lateral line curves downward abruptly at lateral line scales 17-20. Preopercular scales 5-7. No canines on prevomer or palatines (Smith, 1945; Kottelat and others, 1993). These characters overlap those of *Channa melanoptera*. Lee and Ng (1994) stated that the only way to separate these two species is by coloration. *Channa marulioides* possesses an ocellated spot on the upper part of the caudal fin base, similar to that in *C. marulius*. In live specimens, the margin of the ocellus is orange; the margin appears white in preserved specimens. *Channa marulioides* often has a series of dark patches of scales, the posterior and posterodorsal scales each margined by white, along the sides of the body, a character that is absent in *C. melanoptera* (Kottelat and others, 1993; Lee and Ng, 1991, 1994) and *C. marulius*, and may disappear with growth. The iris of the eye is orange or red as in *C. marulius*.

Commercial importance in the United States: Rarely mentioned in aquarist-oriented websites. This species is colorful and has perhaps been found periodically for sale in the aquarium fish trade. Not known from live-food fish markets.

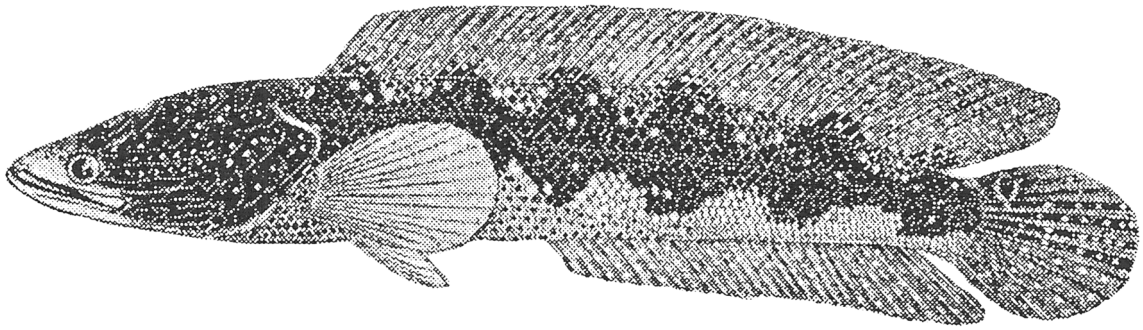
Commercial importance in native range: Ng and Lim (1990) stated that this snakehead is sold in the aquarium fish trade in Singapore, costing up to S$100 per individual. This market likely precludes this species as available in live-food fish markets as a food species.

Environmental concerns: Likely a thrust predator. This is an equatorial/tropical species that, if introduced, might establish only in areas with a similar climate.

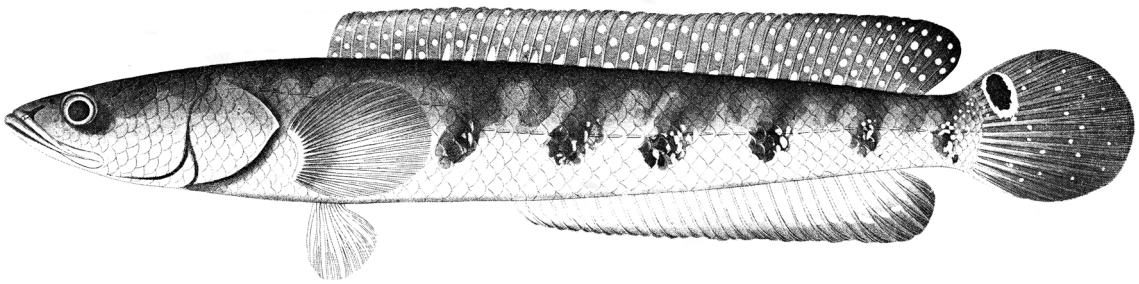


Channa marulioides

Channa marulius (Hamilton, 1822)
Bullseye Snakehead



After Munro, 1955



After Hamilton, 1822; juvenile

Original description: *Ophiocephalus marulius* Hamilton, 1822:65, 367, pl. 17, fig. 19. An account of the fishes found in the river Ganges and its branches. Edinburgh and London, i-vii + 1-405, pls. 1-39. Type locality: "Gangetic provinces," India. No types known.

Synonyms: *Ophicephalus sowara* Cuvier, 1831:426.

Ophicephalus grandinosus Cuvier, 1831:434.

Ophiocephalus leucopunctatus Sykes, 1839:158.

Ophiocephalus theophrasti Valenciennes, 1840:pl. 13, figs. 1-1a.

Ophicephalus pseudomarulius Günther, 1861:478.

Ophiocephalus aurolineatus Day, 1870:99.

Channa marulius ara Deraniyagala, 1945:24, pl. 24.

Common names: **bullseye snakehead**; giant snakehead; great snakehead; cobra snakehead; Indian snakehead; soal (Pakistan); haal (Assam, India); sal, gajal (West Bengal, India); pumurl, bhor (Bijar, India); kubrah, sawal, dowlah (Punjab, India); saal (Orissa, India); poomeenu, phoola-chapa, phool-mural (Andra Pradesh, India); aviri, puveral (Tamil Nadu, India); chaeru-veraal, curuva, bral (Kerala, India); hoovina-murl, madinji, aviu (Karnataka, India); ara, gangara, kalumaha (Sinhalese, Sri Lanka); iru viral (Tamil, Sri Lanka); ara (Sri Lanka); trey raws (Cambodia).

Smith (1945) noted that near Bankok, Thailand, the common name pla chon ngu hao is used for this species; ngu hao means cobra. Talwar and Jhingran (1992) listed a common name of kubrah, used in Punjab, India. This perhaps explains the use of "cobra snakehead" for this species in the U.S. aquarium fish trade.

Native range: Pakistan (Kabul and Indus Rivers; Mirza, 1999); many drainages of India, Sri Lanka, Bangladesh, southern Nepal (Gandaki, Koshi, and Karnali River basins), Myanmar, Thailand, Mekong basin of Laos and Cambodia, and southern China (Day, 1877, Nichols, 1943; Mendis and Fernando, 1962; Qureshi, 1965; Fernando and Indrassna, 1969; Pethiyagoda, 1991; Talwar and Jhingran, 1992; Rainboth, 1996; Kottelat, 2001a). Smith (1945) cited this species as "one of the rarest of the serpent-heads found in Thailand." It is not reported from Malaysia or Indonesia where it appears to be replaced by a somewhat lookalike species, *Channa marulioides*. Nichols (1943) recorded the species from the Yangtze drainage, China. Maurice Kottelat and Tyson Roberts (personal commun. to J.D. Williams, 2001) indicated that *C. marulius*, as currently recognized, is possibly a species complex.

Introduced range: Introduced into residential lakes and adjoining canals in Tamarac, Broward County, Florida, and established as a reproducing population (Florida Fish and Wildlife Conservation Commission, 2001; Howells and others, 2002; Paul L. Shafland, personal commun., 2002).

Size: This species is reported to be the largest of the family Channidae, reaching a length of 120-122 cm (Bardach and others, 1972; Talwar and Jhingran, 1992). Talwar and Jhingran (1992) reported that it grows to 180 cm and a weight of 30 kg in Maharashtra State, western India, noting that a length of 30 cm can be attained in 1 year. Rohan Pethiyagoda and Prachya Musikasinthorn (personal commun., 2002) stated they doubted that any snakehead would reach such a length and were unaware of any specimens of that size. Murugesan (1978) reported a maximum size of 52.8 cm at 8 months from fish stocked at an average length of 37 mm in a tank in Karnataka State, south-western India, with lengths of 38.6 to 48 cm typical in 1 year. He recorded growth of 2.5 to 4 mm/day for the first 3 months and 0.8 to 1.3 mm/day thereafter, with an average growth rate of 7 cm/month. Johal and others (1983) reported that bullseye snakeheads grow faster than *Channa argus, C. punctata*, or *C. striata*, but also noted that growth decreases with increasing age, with the greatest increase in weight occurring during the second year. Their specimens were obtained from River Ghagger, Rajasthan State, northwestern India. Ahmad and others (1990) also reported decreasing growth rate

Adult *Channa marulius* guarding young. Photographed April 23, 2003, in Tamarac, Broward County, Florida, by Ianaré T. Sevi.

Channa marulius, from Khao Laem Reservoir, Kanchanaburi Province, Thailand, June 2002. Photo courtesy of Jean-Francois Helias, Fishing Adventures Thailand.

with increasing age in specimens from River Kali in northern India. Wee (1982) cited *C. marulius* and *C. micropeltes* as the two fastest growing snakeheads.

Habitat preference: Lakes and rivers; deep, clear water with sand or rocky substrate (Talwar and Jhingran, 1992); "rivers usually in the vicinity of mud or fine sands" (Sen, 1985); "deep pools in rivers and occasionally in lakes" (Pethiyagoda, 1991). Jhingran (1984) noted presence of this species in swamps, tanks (=small reservoirs), and ponds, but that it also "prefers deep, clear stretches of water with sandy or rocky bottom." Rainboth (1996) listed preferred habitat as "sluggish or standing water in canals, lakes, and swamps from India to China, south to Thailand and Cambodia." He added that it is often found with submerged aquatic vegetation.

Temperature range: No specific information in literature. Native range of the species is from about 34º N to 7º N, indicating a species that can exist in temperate to tropical conditions. Preliminary temperature testing on individuals from the established southeastern Florida population indicated the lower range to be about 10 ºC (Paul L. Shafland, personal commun., 2002), suggesting that this population did not originate from northern reaches of the native range of this species.

Reproductive habits: Breder and Rosen (1966) summarized brood size from Chacko and Kuriyan (1947) as being about 500 young with parents guarding them until they reached about 10 cm in length. Eggs are pale red-yellow and 2 mm in diameter, hatch in 54 hrs at 16-26 ºC and 30 hrs at 28-33 ºC. Parameswaran and Murugesan (1976a) reported brood sizes of 357 to over 3,600 in swamps in Karnataka State, India. Talwar and Jhingran (1992) remarked that this species lays eggs in a nest and guards them, and that breeding occurs through most of the year. Day (1875) supported this guarding habit by stating, "Colonel Puckle observes 'that they are very savage, protecting their young with great boldness'." Pethiyagoda (1991) noted that males are territorial. In river basins of southern Nepal, it is said to spawn from June until August (Shrestha, 1990). Parameswaran and Murugesan (1976a) indicated spawning occurs in all but the months of December and January in Karnataka State, India, peaking during the rainy season. Jhingran (1984) stated that fecundity of this species is "2,000-40,000 ova." Mirza and Bhatti (1993) indicated a spawning period in Pakistan of April to June with parental protection of eggs and larvae for 6 weeks. Sriramlu (1979) reported two spawning periods (May-June and November-December) for *Channa marulius* in Andhra Pradesh, southeastern India, at altitudes ranging from 548 to 670 m above sea level.

A Mozambique tilapia (*Oreochromis mossambicus*), an introduced species in Thailand, bitten in half by a giant snakehead (*Channa micropeltes*). Photo courtesy of Jean-Francois Helias, Fishing Adventures Thailand.

Srivastava (1980) also reported two spawning peaks (May and January) for this species from a lake at Gorakhpur, in Uttar Pradesh, northern India. This species is one of three snakeheads known to spawn in the absence of vascular aquatic plants (Parameswaran and Murugesan, 1976b).

Food preferences: Regarded as predacious (Jhingran, 1984; Talwar and Jhingran, 1992), especially on other fishes (Schmidt, 2001). The few aquarist-oriented websites that list this species warn that it cannot coexist in aquaria with other fishes once a length of 25 cm is reached. Schmidt (2001) goes further to recommend that two individuals of the same species or mixed with others should not remain in the same aquarium after they reach 25 cm, concluding that "at that stage…they will establish a species aquarium in their own way." He described the species as a "thrust predator", noting that it is rarely found in the aquarium trade and, if found, individuals are juveniles.

Dasgupta (2000) reported stomach contents of *Channa marulius* collected from several localities in West Bengal, India, as consisting primarily of fishes (40 percent), followed by crustaceans (30 percent), “macrophyte tissue” (15 percent), larval insects (10 percent), and algae (5 percent). Ahmad and others (1990) stated the diet of *C. marulius* in the River Kali, northern India, was more than 60 percent fishes and the remainder crustaceans, gastropods, insects, and larval chironomids.

Characters: No patch of scales on gular region of head. Dorsal fin rays 45-55; anal fin rays 28-36; pectoral rays 16-18; pelvic fin rays 6. Lateral line scales 60-70; predorsal scales 16. Lateral line scales drop two rows between the 16th and 18th perforated scale. Scale rows between posterior margin of orbit and preopercular angle 10. Scales on top of head moderate-sized with a rosette of head scales between the orbits, with the frontal head scale in the center of the rosette; two scales between rosette and the basal head scale; 10 scale rows between preopercular angle and posterior border of orbit. Pectoral fin length about half head length. Mouth large, lower jaw with 7 to 18 canines behind a single row of villiform teeth that widen to 5-6 rows at jaw symphysis. Teeth present on prevomer but absent on palatines (Talwar and Jhingran, 1992), and Smith (1945) indicated that canine teeth were absent from both prevomer and palatines.

Talwar and Jhingran (1992) provided information on life colors for both young and adults, commenting that there is a “pale-edged ocellus” toward the

upperside of the caudal fin base that "fades with growth," but provided no information as to size when that happens. Kottelat (2001a), however, stated that the ocellus occurs only in individuals less than 40 cm in standard length. Juveniles often with a series of dark blotches (usually five) bordered posteriorly and posterodorsally by a series of white scales forming a white margin to the blotches (Prachya Musikasinthorn, personal commun., 2002).

The only other species of *Channa* having an ocellus on the upper lobe of the caudal fin near its base is *C. marulioides*. The geographic ranges of the two species do not overlap. In contrast to *C. marulius*, *C. marulioides* has 55-58 lateral line scales, 13-15 predorsal scales, and 5-7 preopercular scales. The lateral line drops abruptly between the 17th and 20th scale in *C. marulioides*, and there is a two row drop of the lateral line in *C. marulius* between the 16th to 18th scale. Juveniles of *C. marulius* may have a series of dark blotches along the sides, margined posteriorly and posterodorsally by a series of white scales; late juveniles and adults of *C. marulioides* also have a series of dark blotches on the sides, but the posterior and posterodorsal scales of these blotches are dark, usually black, and margined with white (Lee and Ng, 1991).

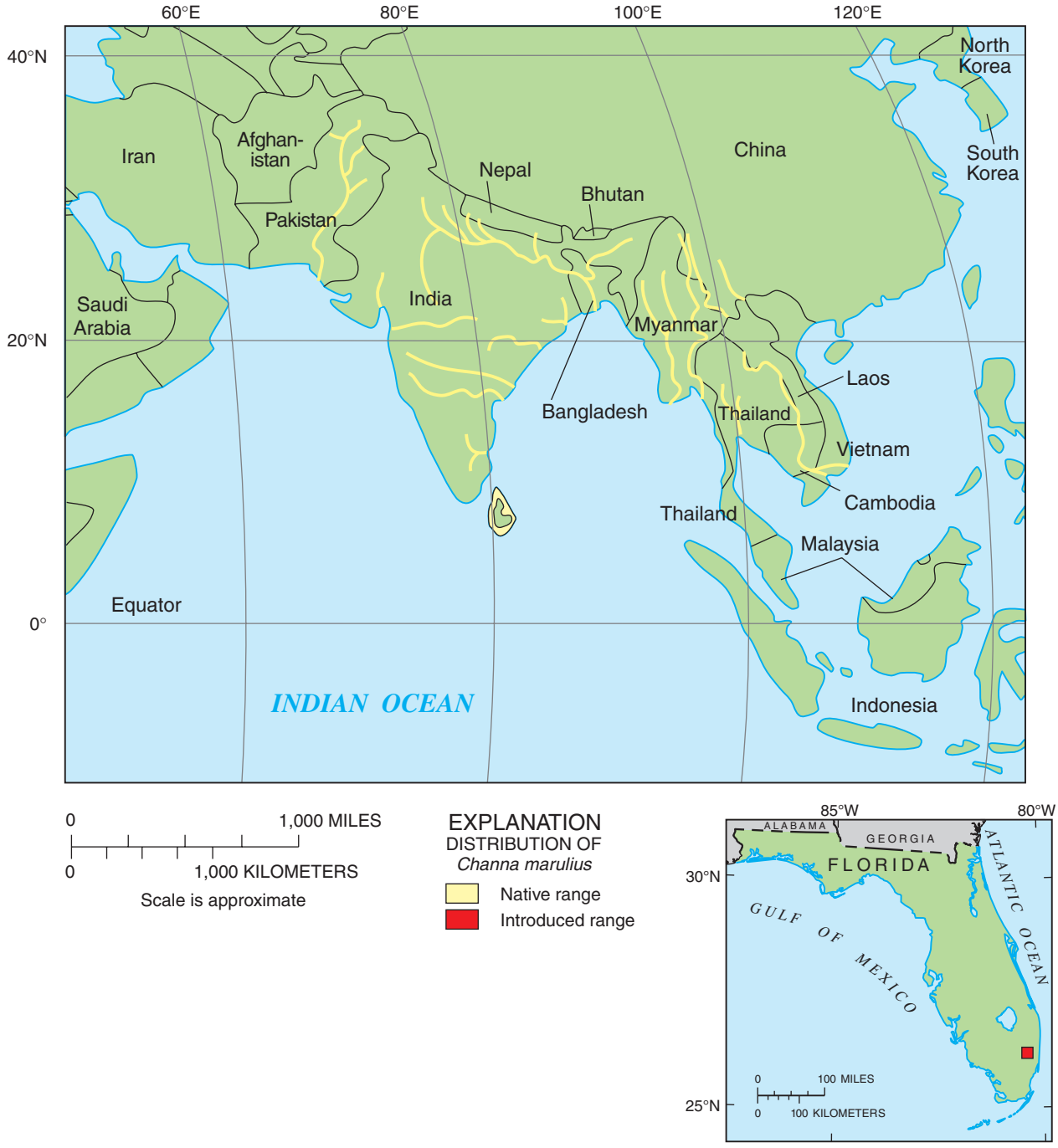
Commercial importance in the United States: Other than occasional mention on aquarist-oriented websites and Schmidt's (2001) statement that "giant snakehead" are rare in the aquarium trade, we found that it was being marketed under the name cobra snakehead as an aquarium fish in the U.S. Aquarist-oriented chat rooms on the Internet suggest it may be second in popularity to *Channa micropeltes*. Its introduction into southeastern Florida may have resulted from an intentional release of aquarium fish by hobbyists. Nevertheless, we recently learned of its availability in live-food fish markets in New York City (Leo Smith, personal commun., 2002) and, therefore, cannot rule out the live-food fish trade as having been the source of this introduction. Nevertheless, its popularity as a game species in Thailand (http://www.fishingasia.com) may have prompted someone to illegally introduce this fish for sport purposes. Using a special permit from the FFWCC to import restricted and prohibited aquatic species, the USGS purchased a young bullseye snakehead from an aquarium fish dealer in Rhode Island in early 2002. In May 2002, law enforcement personnel of the California Department of Fish and Game confiscated a bullseye snakehead from an aquarium fish dealer in the Los Angeles area (Richard Feeney, personal commun. 2002).

Commercial importance in native range: This species is considered an important food fish in India, and it is a significant component of the freshwater fishery in Andhra Pradesh State (Talwar and Jhingran, 1992). Rao and Durve (1989) reported this species as one of three snakeheads fished commercially in Lake Jaisamand, the oldest reservoir in India. Sriramlu (1979) listed this species and *Channa striata* as the most preferred fish in two regions of Andhra Pradesh, India. Bardach and others (1972) noted that it was under culture in India and Pakistan in ponds and ricefields, and irrigation wells that do not support other fishes. Wee (1982) listed the species as being reared in monoculture ponds in India where it is fed tilapia. Nevertheless, Mirza and Bhatti (1993) stated that this species is unsuitable for aquaculture in Pakistan because it is piscivorous. Rainboth (1996) noted that it is "marketed fresh and sometimes alive" in Cambodia. It is touted as an important sport species in Thailand (http://www.fishingasia.com).

Environmental concerns: The native range of this species indicates a temperate to tropical species that, if introduced, has the potential to establish into southern states of the contiguous United States as well as Hawaii. This species is regarded as a predator, particularly on other fishes (Schmidt, 2001). That it has become established as a reproducing population in southeastern Florida indicates the likelihood that it could establish elsewhere if introduced into areas with a suitable temperature regime.

Comments: The diploid number of chromosomes of *Channa marulius* is 44 (Donsakul and Magtoon, 1991).

See map on following page



Channa marulius